Euratom Programme

Euratom Fission Info Session

Brussels, 15 September 2015

"International cooperation - overview and specific action"

Alejandro.Zurita@ec.europa.eu
Albena.Shishkova@ec.europa.eu
Marco.Franza@ec.europa.eu
European Commission
DG Research and Innovation (DG RTD)
Directorate G – Energy
Sector G4.1 – International Agreements (Euratom)

External Relations

European Commission

Euratom Treaty Art. 101-106

Aimed at establishing relations with other countries and international organisations and fostering progress in the peaceful uses of nuclear energy

- Through international agreements or contracts
- Euratom is Party to international conventions
- Euratom is represented by the European Commission
- Close cooperation and high complementarity with the UN's International Atomic Energy Agency (IAEA) and the OECD's Nuclear Energy Agency (NEA) and International Energy Agency (IEA)

IAEA
International Atomic Energy Agency
Atoms For Peace

NEA
Nuclear Energy Agency

iea
International Energy Agency

Euratom Programme (2014-2018)

European Commission

FI: Fission energy
FU: Fusion energy

Implementation of international cooperation mainly through:

- **Euratom Programme (2014-2018) - Indirect actions**
  - FI Calls: Participation of entities from third States
  - FI and FU: Specific collaborative actions with Ukraine & China
  - FU: INCO in European Joint Programming with consortium EUROfusion
  - FU: INCO at tokamak JET → Euratom in-kind contribution to EUROfusion

- **Inter-governmental Agreements**
  - FI: Generation IV International Forum (GIF) Framework Agreement
  - FU: Eight IEA-FPCC Implementing Agreements
  - **Bilateral Research Cooperation Agreements (CAs)** with Third States
    - FI: 4 CAs active on nuclear research or nuclear safety research
    - FU: All 9 CAs active
- Specific **International forums** (IAEA, OECD/NEA, OECD/IEA …)

Participation of Third States

Strategic approach: enhance excellence and competitiveness, tackle societal challenges, develop synergies with external policies

- **General opening:** also any legal entity from third Countries or international organization regardless of its place of establishment (with some exceptions: Community interest, security reasons)
- **Funding for third countries' entities:** just if identified in the WP; or the participation is considered essential; or funding provided under bilateral agreements/arrangements

- Targeted actions with specific third countries
- Common interest, mutual benefit and encouraged reciprocal access to third countries programmes
- Coordination and synergies with initiatives of MSs and associated countries

European Commission

Non-EU participation in Fission Grant Agreements according to EC contribution [in k€]

Third parties	Entities	Participations (in projects)	Co-financed participations	EC contribution	Participants' total cost
Russian Fed.	7	14 (in 12)	10	3,024	6,187
Ukraine	8	13 (in 11)	12	1,033	1,584
Japan	9	12 (in 11)	4	550	7.857
U.S.	9	10 (in 10)	4	418	2.945
Kazakhstan	2	3 (in 2)	3	253	345
CERN (Int.Org.)	1	2 (in 2)	2	217	341
Serbia	2	2 (in 2)	2	164	219
Norway	6	23 (in 15)	1	145	8.638
Belarus	1	1 (in 1)	1	92	103
South Africa	3	6 (in 5)	1	41	2.630
Australia	1	3 (in 3)	0	0	2.101
China	2	2 (in 2)	0	0	1.266
S. Korea	3	5 (in 4)	0	0	792
Canada	2	3 (in 3)	0	0	764
India	1	2 (in 2)	0	0	200
totals	*57*	*99 (in 52)*	*40*	*5,719*	*35,631*
Switzerland	15	58 (in 49)	57	13,269	25,559

Non-EU participation in Fission Grant Agreements Call NFRP 2014-2015 [in k€]

Third states	Entities	Participations (in projects)	Co-financed participations	EC contribution	Total cost
Russian Federation	3	3 (in 3)	2	151	404
Ukraine	1	1 (in 1)	1	113	113
Int. Organisation	1	1 (in 1)	1	106	141
Norway	2	3 (in 2)	0	0	608
Canada	1	2 (in 2)	1	11	243
Mexico	1	1 (in 1)	0	0	231
Japan	1	2 (in 2)	0	0	159
U.S.	1	1 (in 1)	0	0	100
Totals	11	14 in 10	5	381	1,999

Generation IV International Forum (GIF)

European Commission

ESNII

VHTR		◆	◆	◆	◆		◆	◆	◆	
GFR		◆	◆	◆			◆			
SFR		◆	◆	◆	◆			◆	◆	◆
LFR		◆		◆				o		◆
SCWR	◆	◆		◆					◆	◆
MSR		◆	◆	o	o			o	o	◆

VHTR – Very-High-Temperature Reactor (SA)
GFR – Gas-Cooled Fast Reactor (SA)
SFR – Sodium-Cooled Fast Reactor (SA)
LFR – Lead-Cooled Fast Reactor (MoU)
SCWR – Supercritical Water-Cooled Reactor (SA)
MSR – Molten Salt Reactor (MoU

Sustainability
Non-Proliferation and physical protection
Safety and reliability
Minimization of waste production
Economics

◆ System Arrangement (SA)
◆ Memorandum of Understanding (MoU)
o Observer

JRC: Implementing Agent of Euratom
RTD: Indirect actions in support to GIF

GEN IV International Forum

Website: ***www.gen-4.org***

Generation IV International Forum (GIF)

Inter-governmental Agreement - 10 members incl. Euratom

- DG.JRC as Implementing Agent of Euratom
- Six systems: Very high-temperature gas reactors (VHTR), Sodium-cooled fast reactors (SFR), Gas-cooled fast reactors (GFR), Super-critical water-cooled reactors (SCWR), Lead-cooled fast reactors (LFR), and Molten Salt reactors (MSR)
- Technology goals: sustainable development (optimal utilization of natural resources also related to security of supply, waste minimisation and environmental protection), industrial competitiveness, safety and reliability, and proliferation resistance and physical protection

Indirect actions related to GIF features

- 34 related projects from Calls 2007 to 2012 with EC contribution: € 122,5 m

Reactor systems	10 projects - € 30,2 million
Advanced fuel	8 projects - € 40,8 million
Advanced materials	8 projects - € 26,5 million
Codes and data	8 projects - € 25,0 million

Euratom Research Cooperation Agreements

Cooperation Agreements on nuclear research / safety

European Commission

	FUSION Research Cooperation Agreements	FISSION Research Cooperation Agreements	
Brazil	**2013**		
Canada	***(1995 – expired in 2005)***	**1998**	**- Nuclear research**
China	**2008 - R&D Cooperation in Peaceful Uses of Nuclear Energy**		
India	**2010**		***- R&D in peaceful uses of NE (under negotiation)***
Japan	**1988** **2007 (Broader Approach)**		
Kazakhstan	**2004**	**2003**	**- Nuclear safety**
Russia	**2002**	**2002**	**- Nuclear safety**
South Korea	**2006**		
Switzerland	***(1979 - amended in 1982 and suspended in 2014)***		
Ukraine	**2002**	**2002**	**- Nuclear safety**
U.S. / DoE	**2001**	**2003** **2010**	**- Nuclear technology R&D (*)** **- Nuclear safeguards and security**
U.S. / NRC		**2009**	**- Nuclear safety research (*)**

(*) Technical Exchange & Cooperation Arrangements

Euratom-China Nuclear R&D

European Commission

"Agreement between Euratom and P.R. China for R&D Cooperation in the Peaceful Uses of Nuclear Energy" (RD-PUNE Agreement)

Steering Committee MOST – European Commission (EC)

- → **SC-1** on 21 March 2011
- → **SC-2** on 15 November 2012
- → **SC-3** on 11 June 2014

Subcommittee **RTD - CAEA** on **"Fission Coordinated Actions (FCA)"**
- → **FCA-1** on 22 March 2011
- → **FCA-2** on 10 June 2014

Subcommittee **JRC - CAEA** on **"Nuclear Security & Safeguards (SS)"**
- → **SS-1** on 24 March 2011
- → **SS-2** on 10 June 2014

Subcommittee **RTD - MOST** on **"Fusion Energy Research (FU)"**
- → **FU-1** on 12 April 2012
- → **FU-2** on 9 October 2012
- → **FU-3** on 10 June 2014
- → **FU-4** on 16 October 2014

Subcommittee **JRC – NNSA** on **"Nuclear Safety (NS)"**
- → **NS-1** on 13 November 2012

FISSION international forums

Exchange of information on research programmes and discussion on strategic policies with Third States (incl. International Organisations) and also EU Member States

U.N.

- UNSCEAR Scientific Committee of Effects of Atomic Radiation

IAEA (International Atomic Energy Agency)

- SOLC/SOM Senior officials' Liaison Committee, based on Euratom-IAEA MoU
- INPRO International Project Innovative Nuclear Reactors and Fuel Cycles
- WATEC International Radioactive Waste Technical Committee

OECD / NEA (Nuclear Energy Agency)

- CSNI Committee on the Safety of Nuclear Installations
- RWMC Radioactive Waste Management Committee
- NDC Nuclear Development Committee
- CRPPH Committee on Radiation Protection and Public Health
- EGRPS Expert Group on Radiological Protection Science
- NSC/JEFF Nuclear Science Committee / Subcomm. fission & fusion database

Main challenges and expected impact

2016-2017 (1/2)

To reinforce policy initiatives with China, Japan, Ukraine, Russia, and US

→ To be focussed on areas of strategic added value for Euratom (nuclear safety, sharing radiological data, access to experimental facilities, Chinese CFETR tokamak, post-Broader Approach activities...)

→ Under the framework and provisions of Euratom Cooperation Agreements

To advance on increasing consistency and building synergies with MSs on INCO policies and activities

→ when appropriate through 'SNETP' (Sustainable Nuclear Energy Technological Platform) and the consortium 'EUROfusion' - Mappings of collaborative activities

→ Ensure EC assessment of specific arrangements between European and third States' entities/projects following Art. 103 of the Euratom Treaty

Main challenges and expected impact

2016-2017 (2/2)

To negotiate possible association of Ukraine to the Euratom Programme (2014-18)

→ *Support the Ukrainian alignment to Euratom nuclear best practices and safety culture*

→ *Feedback from Ukrainian expertise to the Euratom programme, in particular on operational practices of VVER reactors*

To review -together with JRC- the Euratom policy and commitment to GIF

→ *In terms of safety related issues - Efficient use of resources by focussing on the most advanced reactors systems*

Main INCO topics in Fission WP 2016-17

Euratom fission programme is opened to non-EU partners

Not exhaustive proposed topics in which INCO is specifically recognised as beneficial:

- NFRP 1 - Continually improving safety reliability of Generation II and III
- NFRP 4 - Research on the safety of small modular reactors
- NFRP 7 - Research and Innovation on the overall management of radioactive waste other than geological disposal
- NFRP 9 - Impacts of low dose radiation exposure
- NFRP 12 - Support for careers in the nuclear field
- NFRP 14 - Cross-cutting support to improved knowledge on tritium management in fission and fusion facilities

European Commission

B.5 - External expertise for international cooperation in nuclear research with targeted countries

- Ukraine and China
- Exchange of S&T nuclear expertise through participation of technical experts in programmatic discussion under the legal framework of bilateral Euratom cooperation agreements in nuclear fission and fusion research

B.5 - Ukraine

WP 2016-2017

- **Fission** - This action will principally target radiological data, decommissioning and diversification of nuclear fuel and operational experience of VVERs. This will inter alia facilitate the alignment of Ukraine with European best practices regarding safety, whilst giving EU feedback from Ukraine's experience in operating VVERs

- *Fusion - This action will aim to consolidate the Ukrainian initiative to align the Ukrainian fusion programme to the European Fusion Roadmap and to identify effective contributions to the EUROfusion scope of work*

- **Fission -** This action will notably focus on the promotion of an effective dialogue in the area of nuclear safety and on the further implementation of the foreseen cooperation on the use of large Chinese research infrastructures, in particular related to severe accident R&I, as well as on education and training programmes

- *Fusion [based on the outcome of the China-Euratom Joint Programming WG] - This action will further develop the identified priority areas of the programmatic objectives of China-Euratom work programme for further consideration into the EUROfusion scope of work. Particular focussed areas are the new Chinese Fusion Engineering Testing Reactor (CFETR), the JET programme, and specific physics and technology topics e.g. pulse operation, heat exhaust, and divertor configuration & performance*

Fission R&D - This action will promote Ukraine's integration into the programme, spread European nuclear safety culture and best practices and promote win-win collaborations as well

- Possible Fission R&D areas with **Ukraine**:
  - nuclear and reactor safety, and plant life management
  - health physics and radiological data
  - strategy and policy of radioactive waste management
  - VVER operational experience and nuclear fuel diversification
  - nuclear infrastructures
- Possible Fission R&D areas with **China**:
  - nuclear and reactor safety
  - new reactor concepts
  - nuclear infrastructures

Euratom R&I International Cooperation

Together we can reach higher and also farther !

'Castellers' Barcelona

Cooperation Agreements (CAs) on FUSION & FISSION through Council mandates

European Commission

Fission CAs also including nuclear research/safety

CAs negotiated by **RTD-G4.1**; **JRC-A4**; **ENER-D1/D2**

CAs managed by **RTD-G4.1/G6**; **JRC-A4 & RTD-G4.1/G4**; **ENER-E5**

	FUSION Agreements (FU-CA)	FISSION Agreements (FI-CA)	
Argentina		1997	- Peaceful uses of Nuclear Energy (NE)
Australia		2012	- Peaceful uses of NE
Brazil	2013		
Canada	*(1995 – expired in 2005)*	1959 1998	- Peaceful uses of NE *(currently being re-negotiated)* - Nuclear research
China	2008 - R&D Cooperation in Peaceful Uses of NE		
India	2010		*- R&D in peaceful uses of NE (under negotiation)*
Japan	1988 2007 (Broader Approach)	2006	- Peaceful uses of NE *- Nuclear safeguards and security (under negotiation)*
Kazakhstan	2004	2003 2009	- Nuclear safety - Peaceful uses of NE
Russia	2002	2002	- Nuclear safety *- Peaceful uses of NE (preliminary talks)*
South Africa			*- Peaceful uses of NE (entering into force pending)*
South Korea	2006		*- Peaceful uses of NE (preliminary talks)*
Switzerland	1979 + amended in 1982		
Ukraine	2002	2002 2006	- Nuclear safety - Peaceful uses of NE
U.S.		1996	- Peaceful uses of NE
U.S. / DoE	2001	2003 2010	- Nuclear technology R&D * - Nuclear safeguards and security
U.S. / NRC		2009	- Nuclear safety research *
Uzbekistan		2003	- Peaceful uses of NE

(*) Technical Exchange & Cooperation Arrangements